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Effects of full-time and part-time high-ability programs on developments in students' achievement emotions

Lisette Hornstra[a,b], Ineke van der Veen[c] and Thea Peetsma[b]

[a]Department of Education, Utrecht University, Utrecht, The Netherlands; [b]Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, The Netherlands; [c]Kohnstamm Institute, University of Amsterdam, Amsterdam, The Netherlands

ABSTRACT

This study focused on effects of high-ability programs on students' achievement emotions, i.e. emotions that students experience that are associated with achievement activities. Participants were students in grade 4–6 of primary education: 218 students attended full-time high-ability programs, 245 attended part-time high-ability programs (i.e. external pull-out class). Using propensity score matching, they were matched to a control group of 189 students from regular education with similar cognitive abilities. The respondents filled out questionnaires on their achievement emotions three times during a school year. Results of multilevel analyses showed that students who attended full-time high-ability programs did not report more beneficial achievement emotions compared to similar students in regular education. In contrast, students in part-time programs experienced more positive and less negative emotions during the part-time program compared to the control group in regular education. No differences in longitudinal developments throughout the school year were found between the groups.

KEYWORDS

Gifted; high ability; high-ability programs; pull-out programs; achievement emotions

Introduction

In this study, we examine effects of high-ability programs on the emotions that high-ability students experience during class. Pekrun (2006) refers to "achievement emotions" as emotions that are associated directly to achievement activities or to achievement outcomes. Whereas previous research has focused on cognitive outcomes of high-ability programs (see for example Kim, 2016; Kulik & Kulik, 1992; Rogers, 2007), this study aims to examine whether attending a high-ability program is associated with higher levels of positive achievement emotions such as joy and pride and lower levels of negative achievement emotions such as boredom, hopelessness, anger, and fear. Because it can be difficult to meet the needs

CONTACT Lisette Hornstra t.e.hornstra@uu.nl

of high-ability students in regular classes, specialized educational programs for high-ability students have gained popularity (De Boer, Minnaert, & Kamphof, 2013; Doolaard & Oudbier, 2010; Reis & Renzulli, 2010; Subotnik, Olszewski-Kubilius, & Worrell, 2011). These programs offer high-ability students an educational program outside of regular classes and can either be offered full-time or part-time. Full-time high-ability programs are provided during the whole week, whereas part-time high-ability programs, also known as pull-out classes, are offered for only a few hours or a whole day a week at a setting outside of students' regular school, and these students visit a regular school during the rest of the school week. These programs offer a more challenging curriculum, provide opportunities to interact with other high-ability students, and are usually taught by teachers who specialize in teaching high-ability students (McCoach & Siegle, 2003; Reis & Renzulli, 2010; Subotnik et al., 2011). As such, these programs are expected to offer a learning environment that better supports high-ability students' emotional needs. However, empirical studies on the effects of high-ability programs on students' achievement emotions are very scarce. As achievement emotions are crucial for successful learning outcomes (e.g. Pekrun, 2006), the aim of this study is to examine whether full-time and part-time high-ability programs contribute to positive developments in achievement emotions of high-ability students as compared to regular education.

Educating high-ability students

High-ability programs use a variety of selection methods to select high-ability students. Most full-time and some of the part-time high-ability programs in the Netherlands are available to students who score higher than 130 on an IQ-test (Veltkamp, De Vrije, & De With, 2011). Some programs also apply other or additional criteria, mostly high or outstanding performance scores, but additionally also high levels of motivation, creativity, or inventiveness. There are some programs that are only available to students when there are insufficient resources at their regular school to offer education suitable to their capabilities. Even though selection procedures of specialized high-ability programs are very varied, a shared characteristic is that they focus on talented students with outstanding cognitively abilities or competence. As such, the criteria for these programs are rather broad, but align with the definition of the National Association for Gifted Children (NACG) (2011) that focuses on students with high cognitive potential or outstanding performance. In this study, we will use the term "high-ability students" to address this group of cognitively talented students.

In regular schools, teachers can adapt to high-ability students' needs by offering differentiation through acceleration, compacting, or enrichment (Hoogeveen, Hell, Mooij, & Verhoeven, 2004; Reis & Renzulli, 2010). However, given the heterogeneity of the student population in regular education classes, it can be difficult for teachers to meet the needs of high-ability students and provide them with

adequate instructional support (Reis & Renzulli, 2010). Another concern that may affect the emotional well-being of high-ability students in regular education is a lack of opportunities to interact with like-minded peers (Plucker & Callahan, 2014). Regardless of the instructional practices in regular classes, high-ability students may be more inclined toward underachievement to fit in with their peers (Reis & McCoach, 2000). In contrast, specialized programs aim to offer instruction tailored to high-ability students' needs in classes with similar peers (Renzulli, 2012; Ziegler & Phillipson, 2012).

Most high-ability programs focus on enrichment, sometimes combined with acceleration and compacting of learning materials (Hoogeveen et al., 2004; Plucker & Callahan, 2014). Part-time programs mainly offer enrichment, using materials developed for secondary school or materials specifically developed for the purpose of the part-time program. The curriculum of the part-time program is often not related to the curriculum of these students' regular school, i.e. their so-called "home school." In most cases when students attend a part-time high-ability program, the curriculum at their home school is compacted. This means that high-ability students work on the same materials as their average ability classmates, but in a faster pace. Like part-time programs, full-time high-ability programs also focus on enrichment, sometimes by offering alternative courses such as chess, Spanish, or Japanese. The regular curriculum is usually offered in an accelerated or compacted form (Hoogeveen et al., 2004 Plucker & Callahan, 2014).

In their review study, Hoogeveen et al. (2004) describe some potential advantages of specialized programs for high-ability students. These include that the curriculum is more flexible and tailored to the needs of these students, so that individual interests of students can be better met. Also, specialized programs offer high-ability students opportunities to interact with other high-ability students, teachers have usually specialized in the specific group of high-ability students, and classes at specialized programs for high-ability students tend to be smaller than regular education classes. On the other hand, lack of contact with "regular" students is often mentioned as a potential disadvantage for high-ability students who attend full-time high-ability programs (Hoogeveen et al., 2004; Plucker & Callahan, 2014). Review studies (Hoogeveen et al., 2004; Kim, 2016; Plucker & Callahan, 2014; Reis & Renzulli, 2010; Rogers, 2007) indicate small but positive effects of both full-time and part-time gifted programs on achievement outcomes of high-ability students, and small but positive effects on socio-emotional outcomes, such as motivation. Interestingly, very few studies examined the effects of full-time and part-time high-ability programs on students' achievement emotions, although a major aim of high-ability programs is to offer a learning environment tailored to the specific needs of these students, which should prevent negative emotions such as boredom or fear, and foster positive emotions such as joy and pride.

High-ability students' achievement emotions

Achievement emotions refer to the emotions students experience in school and are increasingly studied as an important part of students' motivation (e.g. Boekaerts, 2001; Pekrun, 2006; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). The control-value theory by Pekrun (2006) describes achievement emotions as situations of affective arousal that are connected to learning activities or achievement outcomes. The relation between achievement emotions and achievement outcomes can be described as reciprocal (Pekrun & Perry, 2014). That is, achievement outcomes can evoke achievement emotions (both prospective, e.g. hope or fear as well as retrospective, e.g. pride or shame), but achievement emotions are also found to affect achievement outcomes. Joy, for example, can contribute to learning and foster learning outcomes, whereas boredom can hinder learning (Pekrun, 2006).

The control-value theory distinguishes emotions based on their *valence*, i.e. the distinction between positive emotions and negative emotions, and on *activation*, i.e. emotions can be activating and encourage learning and emotions can be de-activating and discourage learning. Positive, activating emotions include joy and pride which are found to encourage learning and are reciprocally associated with achievement outcomes. Relief is considered a positive but deactivating emotion, as relief does not activate students for learning. Negative activating emotions include anger, shame, and anxiety and are associated with mixed outcomes: they can undermine cognitive resources, but also motivate students to perform. Negative de-activating emotions on the other hand, such as hopelessness and boredom, univocally predict negative achievement outcomes (for a review, see Pekrun & Perry, 2014). With regard to high-ability students, research has suggested that achievement emotions can be predictive of underachievement (Obergriesser & Stoeger, 2015; Ruthig et al., 2007). That is, high-ability students who experience higher levels of boredom or anxiety are more likely to show underachievement (Obergriesser & Stoeger, 2015; Reis, Hebert, Diaz, Maxfield, & Ratley, 1995).

Most research concerning achievement emotions of high-ability students has focused on boredom. Previous research has suggested that high-ability students experience high levels of boredom in regular education (Gallagher, Harradine, & Coleman, 1997) and that high-ability programs can decrease students' experiences of boredom due to being underchallenged (Preckel, Götz, & Frenzel, 2010). Whether attending high-ability programs may also affect other achievement emotions, such as joy or fear, has to our knowledge not been previously examined. Yet, a number of expectations can be derived from previous literature on students' control and value appraisals in high-ability programs.

Within the control-value theory, students' appraisals of control and value have been defined as the main antecedent of students' achievement emotions (Pekrun, 2006). Characteristics of the learning environment can affect students' achievement emotions through students' appraisals of control and value. That is, when students value the learning activities, and feel in control of their learning,

positive emotions are evoked, whereas low levels of control or value can evoke negative emotions. As high-ability programs aim at providing a more suitable, tailored, and more challenging learning environment for high-ability students in a setting with similar highly able peers (Ziegler & Phillipson, 2012), these programs are expected to increase the value of learning activities. Indeed, various studies reported motivational benefits of homogenous grouping for high-ability students (for a meta-analysis, see Kulik & Kulik, 1992; or for reviews see Neihart, 2007; Rogers, 2007), suggesting that students at high-ability programs may value learning activities more than high-ability students in regular schools. Perceived control refers to "appraisals of control over actions and outcomes (controllability)" and includes students' self-efficacy (Pekrun & Perry, 2014, p. 124). Most studies on high-ability programs have focused on self-concept rather than perceived control. Although self-concept can affect perceived control, it is conceptually different. Self-concept represents students' perceptions of their abilities, whereas perceived control represents students' expectations of what they can accomplish (Bong & Skaalvik, 2003). Also, self-concept relies more heavily on social comparison (Bong & Clark, 1999; Bong & Skaalvik, 2003). Abundant research has shown that high-ability programs are associated with a decline in students' self-concept (e.g. Preckel et al., 2010; Rogers, 2007), in line with the Big-Fish-Little-Pont effect (BFLP; Marsh, 1987). However, given the difference between self-concept and control beliefs, this decline does not necessarily reflect a decrease in perceived control. Some authors have argued that declining self-concept in high-ability students is not necessarily a concern, instead it may indicate a more realistic perception of one's abilities (Neihart, 2007; Plucker et al., 2004). Moreover, there are indications that mastery experiences of challenging task increase perceived control (e.g. Bandura, 1993). As such, we expect that high-ability programs promote rather than diminish perceived control. Hence, attending a high-ability program is expected to be associated with higher levels of perceived value and control which – in line with the control-value theory (Pekrun & Perry, 2014) – is expected to result in less negative activating and de-activating achievement emotions compared to regular education.

The present study

In this longitudinal study, we examined to what extent specialized full-time and part-time programs for high-ability students contribute to developments in students' achievement emotions during the course of one school year. Even though emotions can vary from moment to moment in reaction to specific situations, this study focuses on habitual achievement emotions to find out whether students' achievement emotions across different achievement situations vary in different educational contexts for high-ability students. Previous research indicated that for younger children, achievement emotions are more general across domains or situations, compared to students in higher grades (Goetz, Frenzel, Pekrun, Hall,

& Lüdtke, 2007). This is in line with studies on related motivation constructs that show high levels of generality for children in primary school (Hornstra, van der Veen, & Peetsma, 2016). As argued, research on achievement emotions of high-ability students in specialized high-ability programs is very scarce, especially longitudinal studies. Yet, longitudinal research can help to unravel not only whether high-ability students in different educational contexts experience different achievement emotions, but also whether there are differences in how their achievement emotions develop over time. It could be that characteristics of the learning environment have cumulative effects on achievement emotions over time (Pekrun & Perry, 2014). That is, a non-optimal learning environment may induce negative achievement emotions that build up over time, whereas a more optimal environment may lead to increasingly positive emotions over time. A longitudinal study can provide insight into how achievement emotions develop over time in different educational settings. Furthermore, by comparing both full-time and part-time programs to regular education, we can identify whether potential benefits of high-ability programs are stronger when such a program is attended five days a week instead of only one day a week.

Taken the considerations described above into consideration, we examined the following research question:

> *How do achievement emotions of students attending a part-time or full-time high-ability program develop during the course of one school year compared to achievement emotions of similar students in regular school?*

Based on the expectation that high-ability programs foster students' control and value appraisals, we hypothesized that students who attend a part-time or full-time high-ability program will show more or increasing positive and activating emotions compared to similar students in regular education, and show less or decreasing negative activating or de-activating emotions.

Method

Design

The study has a longitudinal quasi-experimental design. Data were collected at specialized full-time and part-time high-ability programs and regular schools three times during one school year, i.e. at the start, middle, and end of the school year.

Participants

Forty-five classes with students from grade four, five, and six participated in this study, of which 17 classes ($N = 428$) were from regular education, 14 classes were full-time high-ability classes ($N = 218$), and 14 classes were part-time high-ability classes ($N = 245$). Students in this last group attended a high-ability program one

day a week at a different school. The other four days a week, they attended their regular home school. The mean age of the respondents was 10.3 years (SD = 1.0).

Because high-ability students at different programs have been selected based on different criteria, and high-ability students in regular education are not always identified, it can be hard in these types of studies to find suitable control groups and establish effects of such programs. We aimed to address this by the use of *propensity score matching* (PSM) (Thoemmes, 2012). This method can be used to find control groups that are similar to treatment groups in situations where random selection is not possible. Therefore, PSM was used in this study to compare high-ability students in specialized full-time and part-time high-ability programs to a matched control group of students in regular education based on their cognitive abilities. All students were administered a cognitive ability test at the beginning of the school year (the Non-Scholastic Cognitive Abilities Test; Van Batenburg & Van der Werf, 2004; more information on this test is described in the instruments section). Before applying PSM (Thoemmes, 2012), the cognitive ability scores of students in the full-time and part-time high-ability classes (full-time $M = 109.57$, SD = 11.73; part-time $M = 111.32$, SD = 11.07) were significantly higher than the scores of the students in regular education ($M = 98.84$, SD = 15.34; $F(2)=133{,}354$; $p < .001$). The effect sizes for the differences in cognitive abilities between regular education and full-time and part-time education were Cohen's $d = .79$ and Cohen's $d = .93$, respectively, which both represent large effect sizes (Cohen, 1988). After PSM, a control group that was selected from regular education that consisted of 189 students with a similar score on the cognitive abilities test ($M = 108.16$, SD = 11.28) compared to the full-time group ($t(405)=1.231$, $p = .221$). A small difference in test scores was found between the control group and part-time group ($t(432)=2.922$, $p = .004$), but with an effect size of $d = .28$, this difference can be considered to be a small and not likely to affect the outcomes substantially. Yet, to ensure that this difference did not affect the outcomes, the score on the cognitive ability test was included as a covariate in the analyses. The total number of students before and after matching is described in Table 1. All further analyses only included the students that were selected after the matching procedure.

Schools provided information on background characteristics of the students, which included their gender and information on "weighted funding." Schools

Table 1. Number of students before and after propensity score matching.

	Number of students before matching			Number of students after matching		
	Number of classes	Percentage students (%)	Number of students (*N*)	Number of classes	Percentage students (%)	Number of students (*N*)
Regular	17	48.0	428	17	29.0	189
Full-time	14	24.5	218	14	33.4	218
Part-time	14	27.5	245	14	37.6	245
Total	45	100	891	45	100.0	652

in the Netherlands receive additional funding for students whose parents only finished primary school or attended special education (a factor of 1.2 additional funding) and for students whose parents have a low educational level (a factor of .3 additional funding) (Shewbridge, Kim, Wurzburg, & Hostens, 2010). Table 2 shows these background characteristics as well as the grade of the students in each of the three groups. It shows that all three grades were equally represented ($X^2(4)=8.800$, $p = .066$). Gender was not equally distributed across educational settings ($X^2(2)=13.762$, $p = .001$) with boys being overrepresented in the specialized high-ability programs. Additional funding was slightly more common among the regular education control group than among students in special high-ability programs ($X^2(4)=10.546$, $p = .032$). To control for these differences between the groups in grade, gender, and additional funding, these variables were included as covariates in all further analyses to ensure an optimal comparison.

Instruments

Cognitive abilities

At the beginning of the school year, just before the first measurement, the Non-Scholastic Cognitive Abilities Test (NSCAT) (Van Batenburg, 2015; Van Batenburg & Van der Werf, 2004) was administered by the main researcher or a trained research assistant to each participating class during regular class time. The NSCAT measures students' general cognitive abilities. Different versions exist for each grade that is partly overlapping. The NSCAT consists of 85 verbal and non-verbal items. There are five subtests: "composition of figures," "exclusion," "number series," "categories," and "analogies." Factor analyses have revealed that these subtests form one general cognitive ability factor. Reliability of the test was $\alpha = .91$ (Van Batenburg & Van der Werf, 2004).

Achievement emotions

The scales for the class-related achievement emotions questionnaire (AEQ) (Pekrun et al., 2011) were administered to measure students' general achievement emotions in class. Although achievement emotions can also be measured as states, the focus of the present study was on emotions students generally experience in class. Self-report measures of achievement emotions can also validly assess such generalized emotions (Pekrun & Bühner, 2014). For high-ability students who attended a part-time high-ability program during a day a week, the questionnaire was administered at the part-time program and the questionnaire specifically referred to their emotions at the part-time setting by asking "How do you feel in general during the lessons at the [name of the program]?" after which several statements for each emotions were presented. At the full-time program and regular schools, the questionnaire started with the question "How do you feel in general during the lessons at school?" Only the scales that were aimed at general emotions in class were included. Items aimed at relief were not included, as these emotions

Table 2. Frequencies of regular, full-time, and part-time high ability students by gender, additional funding factor, and grade.

	Gender				Additional funding factor						Grade					
	Boys		Girls		.0		.3		1.2		Grade 4		Grade 5		Grade 6	
Regular	89	47.1%	100	52.9%	173	92.5%	13	7.0%	1	0.5%	64	33.9%	56	29.6%	69	36.5%
Full-time	135	64.6%	74	35.4%	124	97.6%	3	2.4%	0	0.0%	72	33.0%	81	37.2%	65	29.8%
Part-time	108	61.4%	68	38.6%	100	97.1%	1	1.0%	2	1.9%	92	37.6%	94	38.4%	59	24.1%
Total	332	57.8%	242	42.2%	397	95.2%	17	4.1%	3	0.7%	228	35.0%	231	35.4%	193	29.6%

are measured in reference to test situations in the AEQ, whereas this study focuses on emotions during class in general. This scale consisted of 27 items. All items could be answered on a five-point Likert scale ranging from totally not applicable to me (1) to totally applicable to me (5).

A confirmatory factor analysis showed that a model with separate latent factors for each emotion (joy, pride, hopelessness, boredom) and a combined latent factor on which the items for the negative activating emotions loaded (anger, fear, shame) fitted the data significantly better (X^2 = 6436.991; RMSEA = .042; CFI = .850) than alternative models in which only positive, negative activating, and negative de-activating emotions were distinguished (X^2 = 9725.395; RMSEA = .057; CFI = .707), and better than a model which each emotion modeled as a separate latent factor (X^2 = 6766.352; RMSEA = .044; CFI = .833). In sum, five scales were distinguished representing the emotions enjoyment, pride, hopelessness, boredom, and negative activating emotions.

Enjoyment. The scale enjoyment referred to joy students experience in class and consisted of four items. An example item is "I often feel excited about the lessons." The internal consistencies of this scale were α = .86, α = .88, and α = .87 at the first, second, and third measurement, respectively.

Pride. This scale assessed the pride students experience in class and consisted of four items. An example item is "I am proud of myself." The internal consistencies of this scale were α = .80, α = .80, and α = .81 at the first, second, and third measurement, respectively.

Hopelessness. This scale referred to hopelessness students experience in class and consisted of four items. An example item is "I often feel I won't be able to manage." The internal consistencies of this scale were α = .67, α = .70, and α = .74 at the first, second, and third measurement, respectively.

Boredom. This scale assessed boredom students experience in class and consisted of six items. An example item is "*I find the lessons uninteresting.*" The internal consistencies of this scale were α = .67, α = .70, and α = .74 at the first, second, and third measurement, respectively.

Negative activating emotions. This scale referred to anger, fear, and shame students experience in class and consisted of nine items. Example items are "*I get embarrassed in class*" or "*I get angry in class.*" The internal consistencies of this scale were α = .87, α = .88, and α = .92 at the first, second, and third measurement, respectively.

Data-analyses

To examine the effects of high-ability programs, developments in achievement emotions of high-ability students at full-time and part-time programs were compared to achievement emotions of the control group of regular education students who did not attend a specialized program. The data of this study have a clustered structure and contained three levels. Students were nested in classes and there were three measurements per student, indicating that measurements were nested in students. Therefore, multilevel analyses with three levels were conducted (class, student, measurement). For each dependent variable (enjoyment, pride, hopelessness, boredom, and negative activating emotions), a series of multilevel models were estimated. First, an empty model was constructed in which only developments in the dependent variable were modeled to estimate the variance at each level. In a next step, covariates (cognitive ability, grade, additional funding, and gender) were added to the model. Next, the variable high-ability education was entered to the model in the form of two dummy variables (full-time and part-time high-ability programs) with regular education being the reference category. Significant effects of these dummy variables, as indicated by a Wald test, would suggest that achievement emotions differed for students in full-time or part-time education compared to the control group of students in regular education. To examine whether *developments* in achievement emotions differed at the programs compared to developments in achievement emotions of the regular education control group, a fourth model was constructed with two interaction terms (measurement*full-time and measurement*part-time).

In longitudinal research, attrition of participants can occur. Missingness in this study was caused by incomplete filling out of the questionnaires, absences for example because of illness, or by influx and outflow of students in the programs. In the regular education control group, 14.8% of students had missing data at one measurement (8.5% at measurement 1; 2.6% at measurement 2; 3.7% at measurement 3) and 2.6% of students missed data at two measurements. In the full-time high-ability group, 19.7% of students had missing data at one measurement (13.8% at measurement 1; 1.4% at measurement 2; 4.6% at measurement 3), and none of the students had missing data at two measurement points. Missingness occurred more somewhat more frequently in the part-time group, due to influx and outflow during the school year. In the part-time high-ability group, 24.5% of students had missing data at one measurement (16.7% at measurement 1; 2.0% at measurement 2; 5.7% at measurement 3) and 15.1% of students missed data at two measurements (5.1% of student missed measurement 1 and 2; 10.0% of students missed data for measurement 2 and 3). Within each group, missingness was not associated with the scores on achievement emotions ($p > .050$). Therefore, the data could be considered to be *Missing at Random*, which can best be accounted for by imputing the missing data (see Schafer & Graham, 2002). The analyses described

Table 3. Means and standard deviations of achievement emotions of high ability students in regular education, full-time, and part-time high ability programs.

		Regular education control group		Full-time high ability program		Part-time high ability program	
	Wave	*M*	SD	*M*	SD	*M*	SD
Enjoyment	1	3.56	.65	3.52	.81	3.99*	.66
	2	3.65	.65	3.60	.78	4.04*	.57
	3	3.56	.68	3.50	.72	3.98*	.61
Pride	1	3.60	.63	3.58	.72	3.92*	.58
	2	3.67	.62	3.61	.67	3.95*	.50
	3	3.59	.64	3.58	.64	3.93*	.55
Hopelessness	1	1.91	.59	1.92	.64	1.82	.56
	2	1.70	.56	1.85*	.65	1.68	.48
	3	1.74	.56	1.88*	.67	1.66	.50
Boredom	1	2.55	.66	2.45	.84	2.05*	.83
	2	2.50	.74	2.47	.85	1.94*	.77
	3	2.60	.80	2.52	.86	1.96*	.73
Negative activating emotions	1	1.78	.52	1.75	.59	1.65*	.55
	2	1.65	.48	1.68	.53	1.55*	.46
	3	1.68	.55	1.67	.56	1.57*	.49

*T-tests indicate a significant difference from the regular education control group ($p < .05$).

before were therefore performed using the maximum likelihood (ML) method to impute the missing data.

Results

Descriptive statistics

Table 3 reports the descriptive statistics of the achievement emotions for the regular education control group and for students attending full-time and part-time high-ability programs. Figure 1 shows the mean scores of the achievement emotions of students in the three groups throughout the school year. The scores from Table 3 and Figure 1 indicate that high-ability students in all three groups report higher levels of positive emotions than negative emotions. Especially in the part-time group, high levels of positive emotions and low levels of negative emotions are experienced.

Effects of high-ability programs on achievement emotions

With multilevel analyses, it was tested whether the differences in achievement emotions are still significant after taking into account the nested structure of the data and relevant background characteristics (cognitive ability, additional funding, grade level, and gender). The outcomes are described for each achievement emotion separately.

Enjoyment

Table 4 reports the outcomes of the multilevel analyses on the effects of high-ability programs on enjoyment. First an empty model (model 1) was constructed

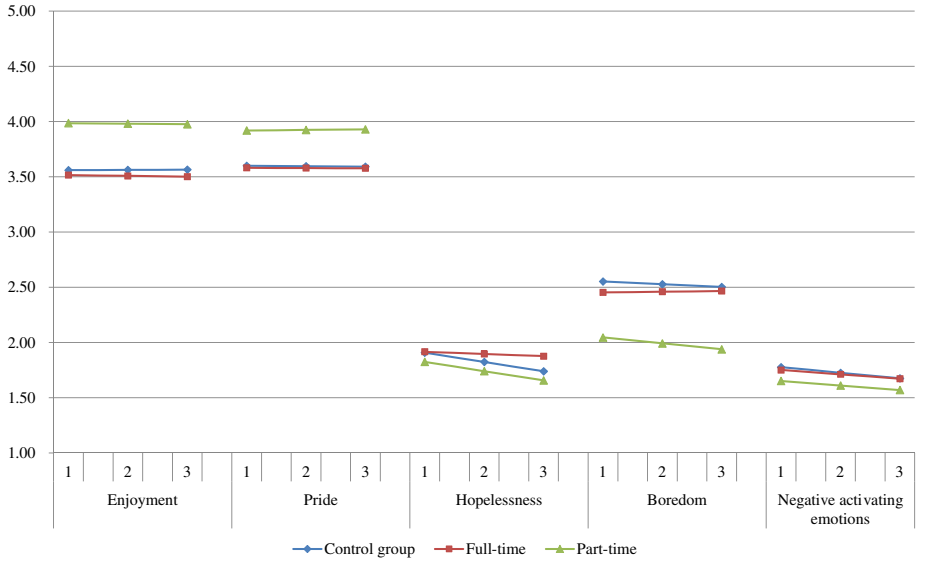

Figure 1. Linear developments in achievement emotions of high ability students in regular education, full-time, and part-time high ability programs during the school year.

in which only change in enjoyment was included as a predictor without any other predictors. The results for the empty model show that 17.1, 47.8, and 35.0% of the variance in changes in enjoyment was situated at the class, student, and measurement level, respectively. The variance components at each of the three levels were significant ($z > 1.96$; $p < .050$). Model 1 also shows a non-significant parameter estimate for measurement ($B = -.01$; $p = .560$), which means that enjoyment does not linearly decrease or increase during the school year. Model 2 in which control variables were added shows that students in higher grades report less enjoyment ($B = -.19$; $p < .001$). None of the other control variables was significant. In model 3, two dummy variables for specialized high-ability programs were added with the control group in regular education as the reference category. No difference in enjoyment was found between the regular education control group and high-ability students in full-time programs. Enjoyment was higher for students in part-time programs, compared to the regular education control group ($B = .32$; $p = .006$). Adding full-time and part-time high-ability programs to the model accounted for 32.4% of the classroom variance in enjoyment beyond the variance already explained by the control variables. In step 4, the interactions between high-ability programs with measurement were added to examine whether enjoyment developed differently in the three settings. Both interaction terms were not significant, which indicated that enjoyment did not develop more positively or negatively in the three settings. In sum, students in full-time high-ability programs reported similar levels of enjoyment compared to the regular education control group, whereas students in part-time programs reported higher levels of enjoyment. This difference remained throughout the school year.

Table 4. Effects of full-time and part-time high ability programs on developments in enjoyment.

	Model 1		Model 2		Model 3		Model 4	
	Empty growth model		Control variables		High ability program		High ability program x measurement	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Fixed part								
Intercept	3.77**	.06	4.82**	.36	4.81**	.43	4.80**	.43
Measurement	−.01	.01	−.04*	.01	−.03	.02	.00	.02
Control variables								
Cognitive abilities			.00	.00	.00	.00	.00	.00
Additional funding			.01	.06	.00	.11	.01	.11
Gender (girl)			−.03	.05	−.03	.06	−.03	.06
Grade			−.19*	.04	−.18*	.04	−.20*	.04
High ability program (versus *regular education*)								
Full-time					−.15	.11	−.05	.13
Part-time					.32*	.11	.35*	.13
Full-time x measurement							−.06	.04
Part-time x measurement							−.04	.04
Random part								
Variance level 3: Class	.10	.03	.07	.02	.04	.02	.04	.02
Variance level 2: Student	.27	.02	.27	.02	.23	.02	.23	.02
Variance level 1: Measurement	.20	.01	.19	.01	.19	.01	.18	.01
R^2 level 3			25.9%		58.3%		58.4%	
R^2 level 2			15.1%		15.0%		14.9%	
R^2 level 1			7.4%		7.5%		8.0%	

*$p<.05$; **$p<.001$.

Pride

Table 5 reports the outcomes of the multilevel analyses on the effects of high-ability programs on pride. Similar steps were followed as with enjoyment. The results for the empty model show that 10.7, 47.1, and 42.2% of the variance in changes in pride was situated at the class, student, and measurement level, respectively. The variance components at each of the three levels were significant ($z > 1.96$; $p < .050$). Model 1 also shows a non-significant parameter estimate for measurement ($B = -.01$; $p = .470$), which means that pride does not linearly decrease or increase during the school year. Model 2 in which control variables were added shows that girls report less pride than boys ($B = -.13$; $p = .024$), and students in higher grades report less pride ($B = -.09$; $p = .021$). Model 3 shows that pride was higher for students in part-time programs, compared to the regular education control group ($B = .27$; $p = .005$). Students in full-time programs reported similar levels of pride compared to the regular education control group ($B = -.11$; $p = .210$). Adding full-time and part-time high-ability programs to the model accounted for 38.7% of the classroom variance in pride beyond the variance already explained by the control variables. The interaction terms added in model 4 were not significant, indicating that pride did not develop differently in the three settings. In sum, students in full-time high-ability programs reported similar levels of pride compared to the regular education control group, whereas students in part-time programs reported higher levels of pride. This difference remained throughout the school year.

Hopelessness

Table 6 reports the outcomes of the multilevel analyses on the effects of high-ability programs on hopelessness. The results for the empty model show that 3.3, 45.7, and 51.0% of the variance in changes in hopelessness was situated at the class, student, and measurement level, respectively. The variance components at each of the three levels were significant ($z > 1.96$; $p < .050$). Model 1 shows a significant parameter estimate for measurement ($B = -.05$; $p < .001$), which means that, on average, hopelessness decreases during the school year. Model 2 in which control variables were added shows that girls report more hopelessness than boys ($B = -.12$; $p = .023$). Model 3 shows that hopelessness was higher for students in full-time programs, compared to the regular education control group ($B = .15$; $p = .041$). Students in part-time programs reported similar levels of hopelessness compared to the regular education control group ($B = -.12$; $p = .106$). Adding full-time and part-time high-ability programs to the model accounted for 19.8% of the classroom variance in hopelessness beyond the variance already explained by the control variables. The interaction terms added in model 4 were not significant, indicating that hopelessness did not develop differently in the three settings. In all, students in full-time high-ability programs reported more hopelessness compared to the regular education control group, whereas students in part-time programs

Table 5. Effects of full-time and part-time high ability programs on developments in pride.

	Model 1		Model 2		Model 3		Model 4	
	Empty growth model		Control variables		High ability program		High ability program x measurement	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Fixed part								
Intercept	3.76**	.05	4.00**	.42	4.00**	.41	3.94**	.41
Measurement	−.01	.01	−.05*	.02	−.04*	.02	−.03	.02
Control variables								
Cognitive abilities			.00	.00	.00	.00	.00	.00
Additional funding			.16	.10	.15	.10	.15	.10
Gender (girl)			−.13*	.06	−.13*	.06	−.13*	.06
Grade			−.09*	.04	−.09*	.04	−.08*	.04
High ability program (versus *regular education*)								
Full-time					−.11	.09	.01	.12
Part-time					.27*	.09	.27*	.12
Full-time x measurement							−.06	.04
Part-time x measurement							.01	.05
Random part								
Variance level 3: Class	.05	.02	.04	.02	.02	.01	.02	.01
Variance level 2: Student	.21	.02	.19	.02	.19	.02	.19	.02
Variance level 1: Measurement	.19	.01	.18	.01	.18	.01	.18	.01
R^2 level 3			14.8%		53.5%			53.7%
R^2 level 2			9.9%		10.1%			10.1%
R^2 level 1			6.6%		6.7%			6.8%

*$p < .05$; **$p < .001$.

Table 6. Effects of full-time and part-time high ability programs on developments in hopelessness.

	Model 1		Model 2		Model 3		Model 4	
	Empty growth model		Control variables		High ability program		High ability program x measurement	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Fixed part								
Intercept	1.88**	.04	2.38**	.38	2.31**	.37	2.36**	.38
Measurement	−.05**	.01	−.06**	.02	−.06**	.02	−.08**	.02
Control variables								
Cognitive abilities			.00	.00	.00	.00	.00	.00
Additional funding			−.07	.10	−.05	.10	−.05	.10
Gender (girl)			.12*	.05	.12*	.05	.12*	.05
Grade			−.03	.03	−.03	.03	−.03	.03
High ability program (versus *regular education*)								
Full-time					.15*	.15	.05	.11
Part-time					−.12	−.12	−.14	.11
Full-time x measurement							.05	.04
Part-time x measurement							.00	.05
Random part								
Variance level 3: Class	.19	.01	.18	.01	.18	.01	.18	.01
Variance level 2: Student	.17	.02	.16	.02	.16	.02	.16	.02
Variance level 1: Measurement	.01	.01	.02	.01	.01	.01	.01	.01
R^2 level 3			.0%		19.8%		18.8%	
R^2 level 2			7.1%		7.7%		7.7%	
R^2 level 1			7.8%		7.9%		8.2%	

*$p < .05$; **$p < .001$.

reported similar levels of hopelessness. This difference remained throughout the school year.

Boredom

Table 7 reports the outcomes of the multilevel analyses on the effects of high-ability programs on boredom. The results for the empty model show that 17.7, 46.2, and 36.1% of the variance in changes in boredom was situated at the class, student, and measurement level, respectively. The variance components at each of the three levels were significant ($z > 1.96$; $p < .050$). Model 1 shows a non-significant parameter estimate for measurement ($B = .00$; $p = .957$), which means that boredom did not linearly decrease or increase during the school year. Model 2 in which control variables were added shows that students in higher grades report more boredom ($B = .24$; $p < .001$). Model 3 shows that boredom was lower for students in part-time programs, compared to the regular education control group ($B = -.50$; $p < .001$), whereas students in full-time programs reported similar levels of boredom compared to the regular education control group ($B = .04$; $p = .798$). Adding full-time and part-time high-ability programs to the model accounted for 43.2% of the classroom variance in boredom beyond the variance already explained by the control variables. The interaction terms added in model 4 were not significant, indicating that boredom did not develop differently in the three settings. In sum, students in full-time high-ability programs reported similar levels of boredom, whereas students in part-time programs reported lower levels of boredom compared to the regular education control group. This difference remained throughout the school year.

Negative activating emotions

Table 8 reports the outcomes of the multilevel analyses on the effects of high-ability programs on negative activating emotions. The results for the empty model show that 1.5, 52.6, and 45.9% of the variance in changes in negative activating emotions was situated at the class, student, and measurement level, respectively. The variance components at the student and measurement level were significant ($z > 1.96$; $p < .050$), whereas negative activating emotions did not significantly vary at the classroom level ($z = 1.19$; $p = .234$). Model 1 shows a significant parameter estimate for measurement ($B = -.04$; $p < .000$), which means that students' negative activating emotions decrease during the school year. Model 2 in which control variables were added shows that girls report more negative activating emotions compared to boys ($B = .11$; $p = .005$). Model 3 shows that no difference between the students in full-time high-ability programs and part-time high-ability programs compared to the regular education control group ($B = .03$, $p = .649$ and $B = -.12$, $p = .052$). The interaction terms added in model 4 were not significant, indicating that negative activating emotions did not develop differently in the three settings. It is noticeable however, that after adding these interaction terms, the main effect

Table 7. Effects of full-time and part-time high ability programs on developments in boredom.

	Model 1		Model 2		Model 3		Model 4	
	Empty growth model		Control variables		High ability program		High ability program x measurement	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Fixed part								
Intercept	2.30**	.07	1.22*	.53	1.44*	.52	1.52*	.52
Measurement	.00	.02	.04	.02	.04	.02	.04	.03
Control variables								
Cognitive abilities			−.01	.00	.00	.00	.00	.00
Additional funding			.00	.13	.00	.13	.00	.13
Gender (girl)			−.04	.07	−.05	.07	−.05	.07
Grade			.24**	.05	.22**	.05	.21**	.05
High ability program (versus *regular education*)								
Full-time					.04	.14	−.06	.17
Part-time					−.50**	.14	−.32	.17
Full-time x measurement							.05	.05
Part-time x measurement							−.11	.06
Random part								
Variance level 3: Class	.13	.04	.13	.04	.07	.03	.07	.03
Variance level 2: Student	.35	.03	.28	.03	.28	.03	.28	.03
Variance level 1: Measurement	.28	.01	.28	.02	.28	.02	.28	.02
R^2 level 3			2.1%		45.3%		46.3%	
R^2 level 2			21.6%		21.4%		21.4%	
R^2 level 1			.0%		.0%		.0%	

*$p < .05$; **$p < .001$.

Table 8. Effects of full-time and part-time high ability programs on developments in negative activating emotions.

	Model 1		Model 2		Model 3		Model 4	
	Empty growth model		Control variables		High ability program		High ability program x measurement	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Fixed part								
Intercept	1.74**	.03	2.15**	.34	2.19**	.33	2.19**	.34
Measurement	−.04**	.01	−.05**	.01	−.05**	.01	−.05*	.02
Control variables								
Cognitive abilities			.00	.00	.00	.00	.00	.00
Additional funding			.02	.09	.03	.09	.03	.09
Gender (girl)			.09	.05	.08	.05	.08	.05
Grade			−.03	.03	−.04	.03	−.04	.03
High ability program (versus *regular education*)								
Full-time					.02	.06	.03	.09
Part-time					−.18*	.06	−.16	.10
Full-time x measurement							.00	.03
Part-time x measurement							−.01	.04
Random part								
Variance level 3: Class	.01	.00	.01	.01	.00	.01	.00	.01
Variance level 2: Student	.16	.01	.15	.02	.15	.02	.15	.02
Variance level 1: Measurement	.14	.01	.14	.01	.14	.01	.14	.01
R^2 level 3			–		–		–	
R^2 level 2			10.5%		10.2%		10.2%	
R^2 level 1			1.2%		1.3%		1.4%	

*$p < .05$; **$p < .001$.

of part-time programs became significant ($B = -.19$, $p = .035$) suggesting that students in part-time programs experience less negative activating emotions than students in the regular education control group.

Discussion

Specialized programs for high-ability students aim at providing a more suitable and challenging program adapted to the specific needs of high-ability students (e.g. Reis & Renzulli, 2010). Although many studies have examined the effects of such programs on achievement outcomes, few studies have focused on affective outcomes. This study aimed to assess whether high-ability programs contribute to high-ability students' achievement emotions. High-ability students in both part-time and full-time high-ability programs as well as the control group in regular education experienced relatively high levels of positive emotions and low levels of negative emotions. Students in full-time high-ability programs did not experience more beneficial achievement emotions compared to a matched control group in regular education, whereas students in part-time programs experienced more enjoyment and pride, and less hopelessness and boredom at the program compared to the control group of students in regular education. This shows that part-time programs have the potential to promote positive and prevent negative achievement emotions. Yet this effect may be limited to the part-time program and does not necessarily spillover to the regular school. No differences in longitudinal developments throughout the school year were found between the groups.

There are several possible explanations why students experience more positive achievement emotions while attending a part-time program, but not in the full-time programs. First, it could be that especially part-time programs promote students' value appraisals which are according to the control value theory (Pekrun, 2006; Pekrun & Perry, 2014) associated with more favorable achievement emotions. That is, learning activities in part-time programs may be valued more highly than in full-time programs or regular education and as such promote positive emotions and prevent negative emotions. High-ability students who attend a full-time high-ability program may quickly get used to the curriculum and consequently may not find it more pleasurable or challenging than regular education anymore. In other words, because they attend the full-time program every day, they quickly get used to this program. In contrast, high-ability student who attend a part-time program are faced with two different settings each week and can compare the high-ability program to their regular school. Because they only attend the high-ability program during one day a week, the program may remain new and exciting for them. Also curricular differences or differences in the emphasis or grades or achievement between full-time and part-time high-ability programs may account for these differences. Even though full-time and part-time programs both focus on enrichment, full-time programs

also offer regular curriculum activities, whereas part-time programs usually only offer enrichment activities (Hoogeveen et al., 2004 Plucker & Callahan, 2014). Hence, it may be that value appraisals and subsequently achievement emotions are more favorable in part-time programs because of the sole focus on enrichment.

Second, increased levels of challenge may evoke higher levels of perceived control in both types of programs, but this effect may counterbalanced by a negative effect on self-concept in the full-time programs. That is, a negative comparison with equally or more able classmates (hence, a BFLP-effect, Marsh, 1987) could negatively affect perceived control. This negative effect may not occur for the part-time students, as they also have their regular class mates at their home school as reference group. Also, students who are selected for a high-ability program are explicitly labeled as being "smart." Students in full-time programs who are placed with other highly intelligent children may soon not be aware of this status anymore. Yet for students, in the part-time program, their status as a smart student is reconfirmed each week, and they may continue to feel "special," which could enhance their perceived control and as such evoke more positive emotions such as enjoyment, pride, and evoke less boredom, hopelessness, and negative activating emotions. More research is needed to confirm whether the outcomes of this study are indeed attributable to differences in value or control appraisals, and to better understand how labeling students for the purpose of selecting them for special high-ability programs may affect students' achievement emotions.

Third, even though we carefully attempted to create a matched control group with students similar in cognitive characteristics to the students in the high-ability programs and we controlled for various background characteristics to ensure a good comparison, we cannot fully exclude the possibility that the groups may also differ with respect to other factors. It could be that especially students who did not do well or who struggled social-emotionally in regular education were attending full-time programs, whereas high-ability students who are doing well in regular education are more likely to remain in regular education or attend a part-time program. If the students who attended full-time programs were indeed students who are emotionally more vulnerable, than the finding that they report similar (positive) achievement emotions than students in regular education could even be an indication that full-time programs may be successful in creating a positive learning environment for these students.

It is noteworthy that we did not find any differences in developments during the school year. The finding that developments did not differ across the groups suggests that any differences in experienced emotions occur quickly after entering the program, rather than emerge or develop gradually. In all groups, positive emotions and boredom remained more or less stable whereas hopelessness and negative activating emotions slightly declined. This seems to contradict previous

research that found evidence for unfavorable developmental trends in achievement emotions, with declining positive emotions and increases in negative emotions (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Frenzel, Goetz, Lüdtke, Pekrun, & Sutton, 2009). However, in line with these previous studies, we found cross-sectional differences between students in different school years: students in higher grades experienced less positive emotions and more boredom than students in lower grades. This was found in regular education and in high-ability programs. This suggests that had we followed the students for a longer time period, we would have found a decline in positive emotions and an increase in boredom.

This study has a number of limitations that need to be noted. First, the findings for high-ability students in the part-time group are limited to the emotions they experience during attendance of the part-time program. As such, we do not know whether the positive effects of the part-time program extend to the home school, or whether the positive experiences at the part-time program have a negative impact on how these students value the learning environment at their home school. For future research, it would be very interesting to examine how attending a part-time program affects achievement emotions in both settings. Second, the results of this study may be specific to students in high-ability classes in the Netherlands and may not be generalizable to high-ability programs in other countries. Third, selection of the regular schools in this study was not random as some of them were recruited via contacts at the high-ability programs. Despite this limitation, this study allows for more certainty about the causal direction of the effects because of its longitudinal nature compared to previous studies on high-ability programs that were mostly cross-sectional. Fourth, even though we carefully attempted to create a matched control group with students similar in cognitive characteristics to the students in the high-ability programs and we controlled for various background characteristics to ensure a good comparison, we cannot fully exclude the possibility that these groups may also differ with respect to other factors.

In this study, we focused on effects of attending high-ability programs on students' achievement emotions. Students in high-ability programs and their matched controls all showed adaptive and rather stable patterns of achievement emotions throughout the school year. High-ability students' achievement emotions were most favorable in part-time programs, but this effect may be limited to the part-time program and does not necessarily spill-over to the regular school. Future research could focus on which elements of these programs contribute to positive achievement emotions of high-ability students in order to create the most optimal learning environments for high-ability students so they can realize their full potential.

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